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RUNNING HEAD: TYPOLOGIES OF GREEK INACTIVE OLDER ADULTS

Typologies of Greek inactive older adults based on reasons for abstaining from exercise and
conditions for change

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Abstract

The main purpose of the study was to examine typologies of non-exercisers based on reasons for physical inactivity and conditions reported to be necessary to change exercise behaviour. These typologies were then compared on psychological variables of interest and exercise history. Questionnaires were distributed to Greek older adults aged 60 and above who were recruited from social clubs and city cafés. Only individuals engaging in no regular exercise were chosen ($N = 188$). The results of hierarchical and k-means cluster analyses revealed two clusters for males (“approachable” and “unconvinced”), and three for females (“unconcerned”, “approachable”, and “unconvinced”). The clusters differed significantly on psychological variables not used in the cluster solution. Exercise history distinguished between clusters only in the male sample. The results reveal that physically inactive older adults are not a homogeneous group of individuals. Implementers of physical activity interventions should probably use a range of strategies that will take into consideration that some sedentary older adults are more amenable to consider taking up exercise than others.

Key words: physical inactivity, amotivation, cluster analysis, exercise

1 Introduction

2 Regular physical activity is particularly beneficial for the elderly population, as it may
3 delay the onset or reduce the severity of a range of chronic diseases (National Institute of
4 Aging, 2001), and improve emotional, cognitive, social and perceived physical functioning
5 (Taylor, Cable, Faulkner, Hillsdon, Narici, & van der Bij, 2004). Despite this, older adults are
6 one of the least active segments of the population (Jones, Ainsworth, Croft, Macera, Lloyd, &
7 Yusuf, 1998). Cross-national differences in activity levels of older adults have been
8 documented with southern Europeans being less physically active than northern Europeans
9 (Vaz de Almeida, Grac, Afonso, D'Amicis, Lappalainen, & Damkjaer, 1999). The decline in
10 physical activity levels with age is partly a biological phenomenon and has been observed in
11 many other species (Sallis, 2000). However, psychological, social, and environmental
12 variables also play an important role in this decline. In this study we focus on some of the
13 psychological factors associated with lack of physical activity and attempt to identify
14 typologies of non-exercisers in a sample of Greek older adults.

15 Although much is known about why people choose to exercise (e.g., Kolt, Driver, &
16 Giles, 2004), less is known about why people do not exercise. In older adults, researchers
17 have suggested that injury, poor health (Booth, Bauman, Owen, & Gore, 1997), lack of time
18 (Lian, Gan, Pin, Wee, & Yi, 1999), and perceptions of lack of skill (Craig, Russell, Cameron,
19 & Beaulieu, 1998) are some salient barriers to exercise. However, little is known about
20 differences in the reasons given for inactivity between groups of sedentary adults, as well as
21 what might encourage them to become more physically active. Physical activity campaigns
22 tend to group sedentary adults into one homogenous group. However, some sedentary adults
23 are more amenable to behavioural change than others. Although the widely used
24 Transtheoretical Model (Prochaska & Velicer, 1997) groups physically inactive individuals
25 into "precontemplators", "contemplators" and "preparers", there is evidence to suggest that

physically inactive groups should be even further differentiated. For example research has identified different clusters of precontemplators (Dijkstra & De Vries, 2000; Richards Reed, 1999) and contemplators (Gorely & Bruce, 2000). Thus, targeting sedentary individuals for physical activity interventions is complex as different factors and considerations need to be taken into account (King *et al.*, 2006).

The heterogeneity of motivation in sedentary adults was evidenced in a theory-driven study by Vanden Auweele, Rzewnicki, and Van Mele (1997), which constructed typologies of physically inactive middle-aged Belgian adults based on reported reasons for not exercising and conditions of change. The authors identified five dimensions of physical inactivity which emerged from factor analysis: exercise as “Not Relevant”, “Unnecessary”, “Negative Feelings” about exercise, exercise as “Too Risky”, and exercise requiring “Too Much Effort”. In terms of the conditions that could prompt the participants to start exercising, the authors found two factors; The first referred to intending to adopt exercise if their health was threatened (“Health Threat”), and the second one referred to participants’ willingness to exercise if they received an appropriate offer, such as exercising with family or friends (“Appropriate Offer”).

The aforementioned reasons for inactivity and conditions of change were subjected to a cluster analysis, which resulted in two typologies or clusters for males. The first ($n=80$) was labelled the “unconcerned” or indifferent toward exercise and included those who had low scores on all reasons for inactivity and conditions of change. The second ($n=31$) was labelled the “accountants” and incorporated those who had higher scores on the reasons for inactivity as well as on conditions for change, that is, these individuals would consider taking up exercise if their health was under threat or if an appropriate offer was made. The typologies for females revealed a different pattern to those for males. Specifically, females were grouped into the “unconcerned”, the “opposed” and the “approachable” clusters. Similar to the

namesake male cluster, the "unconcerned" ($n=78$) had low to moderate scores on all variables. The "opposed" ($n=14$) had moderate to high scores on all variables, whereas the "approachable" ($n=22$) had more favourable responses with low scores on the reasons for inactivity and higher scores on conditions for change.

The results of Vanden Auweele *et al.*'s (1997) study suggest that some sedentary adults are more amenable to change than others. This might have practical implications for the design of physical activity interventions. However, whether the results of that study are applicable to other age and cultural groups is as yet unknown. Furthermore, although Vanden Auweele *et al.* compared the cluster groups in terms of age and sports history, the authors did not contrast their clusters on psychological variables associated with exercise intention or behaviour. In the present study, we first examined whether Vanden Auweele *et al.*'s typologies can be generalised to an older sample from a different culture (Greek). We then compared the clusters on variables that have been shown to be associated with exercise involvement. Some of these variables are attitudes to exercise and perceived behavioural control, taken from the Theory of Planned Behaviour (Ajzen & Madden, 1986). Unlike subjective norms, attitudes and perceived behavioural control are related to exercise intentions and exercise behaviour change (e.g., Courneya, 1995; Hagger, Chatzisarantis, & Biddle, 2002).

Another psychological variable we considered in our study was self-efficacy, sometimes operationalised as barrier efficacy, because it is one of the most consistent predictors of physical activity behaviour among older adults (Rhodes, Martin, Taunton, Rhodes, Donnelly, Elliot, 1999; Stevens, Lemmink, de Greef, & Rispen, 2000). For example, in a cross-sectional study with older sedentary individuals, Stevens *et al.* (2000) found that barrier and task efficacy scores clearly distinguished between the precontemplation and contemplation/preparation stages, suggesting that those who are less inclined to participate in

physical activity (i.e. the precontemplators) are less efficacious than those who are considering changing their behaviour (contemplators/preparers). Exercise amotivation might be another distinguishing factor between the clusters, with those not intending to change having higher amotivation scores. According to Self-Determination Theory (Deci & Ryan, 2000), amotivation is characterised by the lack of value for an activity, or the belief that the activity will not result in desired outcomes. In the exercise setting, amotivation has been found to be a negative predictor of intentions to exercise (Chatzisarantis, Hagger, Biddle, Smith & Wang, 2003; Thøgersen-Ntoumani & Ntoumanis, 2006).

We also included physical self-perceptions as a fifth distinguishing factor. These perceptions are an important outcome and antecedent of physical activity in older adults (e.g., Taylor & Fox, 2005), but they can also be an antecedent of it (Fox, 1997). Lastly, we also included the trait measure labelled resistance to change, which refers to an individual's dispositional inclination to resist changes (Oreg, 2003). This variable has been found to predict lack of voluntary changes in the academic schedules of university students.

Vanden Auweele *et al.* (1997) identified that in their sample of middle-aged Belgian adults “never-exercisers” were more likely to report that exercise was “irrelevant” and “unnecessary”, suggesting that these individuals had more intransigent attitudes towards exercise. In contrast, Vanden Auweele *et al.* indicated that ex-exercisers might be more receptive to changing their physical activity patterns as they tended to report that an “appropriate offer” could help them change. Thus, in the present study, we examined potential differences in the exercise histories of participants in the cluster typologies.

We aim to extend the work carried out by Vanden Auweele *et al.* (1997) on typologies of non-exercisers by using a sample that was older and from a different culture (Greek). In an attempt to externally validate the clusters, they were then compared on measures of attitudes to exercise, perceived behavioural control, barrier efficacy, exercise amotivation, resistance to

change and physical self-worth. Finally, they were also compared on exercise history. Based on Vanden Auweele *et al.*'s (1997) findings, we hypothesized that for both males and females, at least one cluster would emerge of individuals unconcerned/opposed to change, and at least one other cluster would emerge which would include older adults more approachable to change. Second, these cluster groups (for males and females) would differ significantly on all validation variables. Specifically, we hypothesised that individuals more amenable to behavioural change would have more favourable attitudes and physical self-perceptions, higher perceived behavioural control, barrier efficacy, lower amotivation and less resistant to change, compared to those who were unconvinced or opposed to change. Finally, it was hypothesised that significant differences would also exist between clusters in exercise history, with cluster(s) more amenable to change consisting of a significantly larger number of exercisers than never-exercisers compared to clusters of those unconcerned/opposed to change. The latter cluster(s) would consist of a significantly larger number of never-exercisers.

Method

Participants

One hundred and eighty eight physically inactive Greek adults ($n=90$ males and $n=98$ females) volunteered to take part in the study. Their mean age was 70.20 years ($s=3.66$). Participants were identified as physically inactive based on their scores on the stages of change-short form (see below).

Measures

Exercise-Related Variables

Stages of Change-Short Form (Marcus, Selby, Niaura, & Rossi, 1992).

This is a 5-item scale that assesses five stages of exercise behaviour change. The participants were first given a definition of regular exercise (i.e., any physical activity such as brisk

walking, jogging, bicycling, swimming or any other physical activity which made them breathe moderately fast, adding to a total of minimum 30 minutes on at least five days per week). They were then asked to indicate whether, according to that definition, they a) did not engage and did not intend to engage in exercise in the next six months (precontemplation) b) they did not engage but were thinking of starting exercise in the next six months (contemplation), c) they did not exercise but were planning to start within the next month (preparation), d) they engaged in regular exercise but for less than 6 months (action), and e) they engaged in regular exercise and had done so for more than 6 months (maintenance). The questionnaire has been shown to relate to objective and self-report measures of physical activity (e.g., Cardinal, 1997).

Exercise History

To examine whether there were any differences between the clusters in exercise history, we used one item from Marcus and Forsyth's (2003) physical activity history scale. Participants were asked how long it had been since they had been regularly exercising (according to the definition provided in the introduction to the stages of change measure). Response options were "less than six months", "more than 6 months but less than one year", "more than 1 but less than 2 years", "more than 2 but less than 5 years", "more than 5 but less than 10 years", "10 years or more", and "I have never been regularly physically active". Due to the small number of participants reporting that they had been regularly exercising within the past five years (males $n=16$; females $n=16$), we decided to construct a dichotomous variable by categorising males and females into "ex-exercisers" (males $n=48$; females $n=41$) to include all categories but the last, and "never exercisers" (males $n=33$; females $n=46$).

Psychological Factors

Reasons for Inactivity and Conditions for Change

For brevity reasons, we used two items to measure reasons for inactivity from each of the five factors identified by Vanden Auweele *et al.* (1997). The items were chosen based on the results of a small pilot study that examined their face validity. Example items are “I am not interested in exercise” (Not Relevant), “With a healthy, active lifestyle exercise is unnecessary” (Unnecessary), “Exercise is too bothersome” (Negative Feelings), “At my age, exhausting and forcing myself with exercise cannot be healthy” (Too Risky), and “The regularity of exercise needed to get benefits requires too much dedication” (Too Much Effort). Also, to measure conditions for change, in other words, factors that may induce future exercise involvement, we used three items with high face validity from each of the two factors also identified by Vanden Auweele *et al.* (1997). Sample items are “I would start/or resume exercising if...I had physical complaints that made me anxious or panicky” (Health Threat), and “...There was a health club which offered the kind of exercises I am good at” (Appropriate Offer). The items for reasons for inactivity and conditions for change were measured on a six-point scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). We conducted two exploratory factor analyses, one for reasons for physical inactivity (5 subscales) and one for conditions for change (2 subscales). The results showed that the items of each subscale loaded together on the same factor. Further, their loadings on that factor were substantially higher than their secondary loadings on other factors. The factor loadings matrices are available upon request.

Attitudes

Attitudes toward exercise were measured with bipolar adjective scales, similar to Courneya (1995). The response category ranged from -3 to 3. Participants were given the stem “My participating in regular exercise is/would be...”, followed by four items that assessed the evaluative dimension of attitude (useful-useless, harmful-beneficial, wise-foolish, bad-good), and four items that measured the affective aspect of attitude (enjoyable-unenjoyable, boring-

interesting, pleasant-unpleasant, and stressful-relaxing). Previously, researchers have shown that this type of measure reflects accurately the components of the attitude construct in the Theory of Planned Behavior (Trafimow & Sheeran, 1998). The alpha reliability coefficient in the present study was $\alpha = 0.91$.

Perceived Behavioural Control

Three items were used to measure perceived behavioural control, as operationalised by Ajzen and Madden (1986). An example item is “for me to engage in regular exercise is/would be...” (-3 = extremely difficult; 3 = extremely easy). The internal reliability coefficient of this scale in the present study was $\alpha = 0.67$.

Barrier Efficacy

Also referred to as control beliefs (Courneya, 1995), barrier efficacy was operationalised as in Ajzen and Madden (1986). The statement “I am confident that I could engage in regular exercise even if...” was followed by seven commonly reported barriers to physical activity (e.g., bad weather, too busy, etc.). Responses were measured on a seven-point scale ranging from -3 (*extremely unlikely*) to 3 (*extremely likely*). In the present study, the alpha reliability coefficient was $\alpha = 0.76$.

Physical Self-Worth

This is a six-item subscale from the Physical Self-Perception Profile (PSPP; Fox & Corbin, 1989). The questionnaire employs a force-choice structured alternative format in order to minimise socially desirable responses. For each item two alternative statements are provided. The participants must first decide which of the two statements relates to them best, and then indicate if the chosen statement is *sort of true* or *really true* for them. An example is “Some people feel extremely proud of who they are and what they can do physically BUT Others are sometimes not quite as proud of who they are physically”. The PSPP is a widely used scale which has been shown to be reliable and valid across a wide range of populations (Byrne,

1996). The internal reliability coefficient of the physical self-worth subscale in the present study was $\alpha=0.80$.

Resistance to Change

This scale measures an individual's disposition to resist changes (e.g., "I generally consider changes to be a negative thing"). This 18-item scale has four factors: routine seeking, emotional reaction, short-term thinking, and cognitive rigidity. For the purpose of the present study, we used an aggregate measure of resistance to change. The items were measured on a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Oreg (2003) found support for the scale's convergent, discriminant, concurrent and predictive validity across different contexts. In the present study the internal reliability coefficient was $\alpha=0.74$.

Exercise Amotivation

Markland and Tobin's (2004) 4-item amotivation subscale of the Behavioural Regulation in Exercise Questionnaire-2 was also used. An example item is "I don't see why I should have to exercise" with responses ranging from 0 (*not true for me*) to 4 (*very true for me*). The alpha reliability coefficient of the amotivation subscale in the present study was $\alpha=0.88$.

Procedures

Participants were recruited from social clubs for the elderly as well as city cafés in and around Athens, Greece. All participants provided written informed consent. The ethical guidelines of the American Psychological Association for treating adult participants were followed throughout the study. The questionnaire administration was supervised by a trained research assistant. The instruments used in this study were translated from English to Greek by the second author. In addition, another bilingual person with expert knowledge of both languages translated the questionnaires back to English. Discrepancies between the two translations were compared, and the wording was changed where necessary until consensus

was reached. The study had the approval of the Ethics Subcommittees of a British and a Greek University.

Data Analysis

In each gender group, a hierarchical cluster analysis was performed followed by a k-means confirmatory cluster analysis in order to identify distinct profiles based on reasons for inactivity and conditions for change. In an attempt to validate the cluster solutions, MANOVA tests were carried out to compare the clusters on variables *not* used to create the cluster solution.

Results

The distribution of participants across the stages of change was as follows: precontemplation = 48.30%, contemplation = 10.10%, preparation = 6.30%, action = 13.20%, maintenance = 22.10%. Non-exercisers were deemed to be those in the first three stages, whereas exercisers were those in the last two stages. For the purpose of the present study, only non-exercisers were chosen.

Hierarchical cluster analyses were carried out separately for males and females, in line with the study by Vanden Auweele *et al.* (1997). Prior to the analyses, all multivariate and univariate outliers were deleted ($n = 20$) and the remaining cases were converted to z scores (Hair, Anderson, Tatham, Black, 1998). The Ward method was used as it avoids the problem of “chaining” associated with other methods (Aldenderfer & Blashfield, 1984). Other methods provided by SPSS were also explored. In the vast majority of cases, the agglomeration coefficients pointed to the same direction regarding the number of clusters in the two samples.

The similarity measure used was the squared Euclidean distance. To determine the number of clusters, the agglomeration schedule coefficients were inspected. According to Hair *et al.* (1988), small coefficients indicate that fairly homogenous clusters are being merged. Large coefficients indicate that clusters with quite dissimilar members are being

combined. To decide the number of clusters in the data, one should look at fairly large increases in the coefficients between two adjacent sets. Z scores of ± 0.50 were used as the criterion for interpreting when the participants in the individual clusters scored relatively high or low on the variables of interest compared to the participants in the other cluster(s) (see Weiss, Ebbeck & Horn, 1997). Other criteria also exist to determine the number of clusters in a solution. In a review of papers in health psychology using cluster analysis, Clatworthy, Buick, Hankins, Weinman and Horn (2005) reported that the inspection of the agglomeration coefficients was the most frequently employed criterion in these studies.

For the males, examination of the agglomeration schedule coefficients suggested that a two cluster solution would be the most parsimonious. The two clusters that emerged were labelled the “approachable” ($n=37$) and the “unconvinced” ($n=45$). The “approachable” had moderate to low scores on most of the reasons for inactivity and were more likely to start exercising as a result of future possible deteriorating health. In contrast, the “unconvinced” had higher scores on the reasons for inactivity, especially in relation to the statement that exercise requires too much effort, and moderate scores on the conditions for change. Although this group did not quite oppose the idea of exercise adoption (as their scores on conditions for change were moderate), equally, they were not contemplating taking up exercise if circumstances changed in the future. To fine-tune the results of the hierarchical procedure, k-means clustering was used with the same data. As suggested by Hair *et al.* (1998), the centroid values obtained from the hierarchical analysis were used as the initial seed values for the k-means analysis. The results showed that the size of the clusters (k-means: “approachable” $n=40$; “unconvinced” $n=42$) and the final centroid values were quite similar to those obtained from the hierarchical solution, indicating relative stability of the cluster solution. Figure 1 graphically displays the cluster solutions for the hierarchical and k-means analyses.

Aldenderfer and Blashfield (1984) suggested the comparison of clusters on variables *not* used to create the cluster solution. This external validation procedure selects variables of theoretical and practical importance and uses them as benchmarks for validating the identified clusters. Six such variables were selected: attitudes to exercise, perceived behavioural control, exercise amotivation, barrier efficacy, resistance to change, and physical self-worth. A one-way MANOVA was carried out to examine the differences between the two cluster groups in these variables. The MANOVA was significant (Pillai's Trace = 0.202; $F_{6, 74} = 3.12$; $P < 0.01$; partial $\eta^2 = .20$). The univariate tests showed that the "approachable" had significantly more positive attitudes to exercise, lower exercise amotivation and higher barrier efficacy compared to the "unconvinced" (see Table 1). No differences were found in the remaining variables. Unexpectedly, a chi-square analysis revealed a significantly higher number of "never exercisers" and a significantly lower number of "ex-exercisers" in the "approachable" compared to the "unconvinced" cluster group ($\chi^2 = 5.66$; d.f. = 1; $P < 0.05$). The effect size was small to moderate ($w = 0.26$; see Cohen, 1988).

The same procedures were carried out to identify clusters in the female sample. An examination of the agglomeration schedule coefficients suggested a three cluster solution. The clusters were labelled the "unconcerned" ($n=13$), the "approachable" ($n=41$) and the "unconvinced" ($n=32$). The "unconcerned" had the lowest scores on reasons for inactivity compared to the other two clusters, but they were also not contemplating to change. This cluster resembled somewhat the "unconcerned" female cluster reported by Vanden Auweele *et al.* (1997). The "approachable" had moderate scores on the reasons for not exercising and indicated that they would be more likely to become active as a result of an appropriate offer. Although they were slightly more negative in terms of their reasons for not exercising compared to the respective male cluster, they essentially represented the same profile of

individuals. The “unconvinced”, similar to the male cluster, had high scores on the reasons for inactivity and moderate scores on the conditions for change.

Subsequent to the hierarchical cluster analysis, a k-means analysis was carried out with the same data. The size of the groups (k-means: “unconcerned” $n=14$, “approachable” $n=38$, and “unconvinced” $n=34$) and the final centroid values were very similar to those obtained from the hierarchical procedure. To validate the cluster solution, the cluster groups were compared on the same six variables as those used for the males. The one-way MANOVA was significant (Pillai’s Trace = 0.458; $F_{12, 158} = 3.91$; $P < 0.001$; partial $\eta^2 = 0.23$). The univariate tests revealed that the “unconcerned” had more positive attitudes to exercise, lower amotivation and higher barrier efficacy than the other two clusters. In turn, the “approachable” had more positive attitudes and higher barrier efficacy than the “unconvinced” (see Table 2). Finally, a chi-square test revealed that there were no significant differences between the clusters in exercise history ($\chi^2=4.59$; d.f.=2; $P > 0.05$). The effect size was small to moderate ($w = 0.23$).

Discussion

The present study aimed to examine typologies or clusters of non-exercisers, based on reasons for not exercising and conditions that might facilitate exercise adoption, separately in male and female Greek older adults. The cluster solutions were externally validated by examining differences between the identified clusters in exercise history and psychological variables not used in the cluster solutions.

The findings were largely in agreement with our first hypothesis and only partially in agreement with the results reported by Vanden Auweele *et al.* (1997). The results suggest that for both males and females, distinct groups of non-exercisers can be identified, with some more amenable to change than others. As most of the non-exercisers in the present sample were precontemplators according to the Stages of Change Model, the identification of two

clusters indicates that precontemplators might not be one homogenous group, a suggestion also made by previous researchers in the area of exercise (Richards Reed, 1999) and smoking (Dijkstra & De Vries, 2000) although the latter focused on a different age and cultural group. Specifically, our findings suggest that a sizeable proportion of both male and female older adults in Greece (i.e., the “approachable” clusters) do not see exercise as being irrelevant, or requiring too much effort, and do not have negative feelings towards exercise. These individuals were also more likely to start exercising in the future as a result of either a health threat (males) or an appropriate offer (females). In contrast to Vanden Auweele *et al.* (1997), we subjected our cluster solution to a validation procedure in which it was shown that those groups more amenable to change had more positive attitudes to exercise, higher barrier efficacy, and lower levels of amotivation (only in the male group) than those not convinced about the necessity of change. These findings suggest that not all pre-contemplators are “hard to reach” as some might believe.

In males, besides the “approachable”, a second cluster group emerged which was called the “unconvinced”. This group had high scores on the beliefs that exercise is not relevant and that it requires too much effort, had negative feelings towards exercise, but only moderate scores on the conditions for change. We labelled this group as the “unconvinced” because they had negative beliefs toward exercise and were not convinced that a health threat or an appropriate offer would be sufficient to make them more active. This group differs from the “accountant” cluster identified by Vanden Auweele *et al.* (1997), which had relatively high scores on both the reasons for inactivity and on the conditions for change. The “accountants” in the Vanden Auweele *et al.* (1997) study were negatively predisposed towards exercise. However, they engaged in a cost-benefit analysis and were willing to change their behaviour if necessary, unlike our “unconvinced” cluster. Vanden Auweele *et al.* (1997) also reported a second cluster, much larger than the first, of “unconcerned” male non-exercisers. These

1 individuals reported relatively low scores on both the reasons for inactivity and the conditions
2 for change. This cluster did not emerge in our male sample. The difference in the cluster
3 solutions that emerged between the two studies might reflect age differences. For example,
4 some older men (the “approachable”) might be less negatively predisposed toward exercise,
5 perhaps because they are more concerned about their health compared to middle-aged men.
6 Due to the lack of previous pertinent cross-cultural comparisons, we are not in a position to
7 infer whether our findings might also reflect cultural differences.

8 In contrast to the two clusters identified for males, three clusters emerged in females: the
9 “approachable”, the “unconvinced”, and the “unconcerned”. Despite some differences in the
10 mean scores, the first two clusters had essentially the same pattern of responses to the
11 namesake clusters identified in the male sample. The fairly large proportion of females in the
12 “unconvinced” group is perhaps not surprising, as O’Brien Cousins (2000) found in a
13 qualitative study of women aged 70 years and older that perceived risks of physical activity
14 outweighed its potential benefits. As expected, compared to the “unconvinced” group, the
15 “approachable” cluster had more positive attitudes towards exercise and higher barrier
16 efficacy. A third smaller cluster emerged in the female sample which we called the
17 “unconcerned”. The females in this group reported low scores on most of the reasons for not
18 exercising, yet they were not likely to act as a result of either a health threat or an appropriate
19 offer. In fact, the “unconcerned” individuals had significantly more positive attitudes, higher
20 barrier efficacy and lower levels of amotivation compared to those in the “approachable”
21 group. Perhaps the former group represents those women who, although they have reasonably
22 positive attitudes and beliefs about exercise, they do not prioritise it as highly as other
23 behaviours in improving their health or lives. It would be interesting if in future researchers
24 used qualitative methods to examine the reasons why these women are not likely to act as a

1 result of either a health threat or an appropriate offer. Perhaps other conditions for change are
2 more applicable to this group.

3 Vanden Auweele *et al.* (1997) also identified three clusters in their female sample, two
4 of which were called “approachable” or “unconcerned” about exercise. The third cluster was
5 called the “opposed”, however, the individuals in this cluster had moderate to high scores on
6 all variables, in particular on the two conditions for change. Thus, we feel that the term
7 “opposed” is not appropriate, because the individuals in this cluster resembled more those in
8 our “unconvinced” group.

9 We also hypothesised that clusters with individuals more amenable to change would
10 consist of a higher number of ex-exercisers as opposed to never exercisers, whilst those
11 unconvinced about change would demonstrate the opposite pattern. In fact, our predictions
12 were not supported. Most of the male participants who had never been regularly active were
13 more inclined to change, whereas most of the ex-exercisers were unconvinced about change.
14 This is surprising given that ex-exercisers, due to their exercise experience, would be
15 expected to perceive more reasons to exercise, be more accustomed to exercise and thus
16 perhaps also have higher exercise barrier efficacy, compared to those who have no relevant
17 experience. Thus, our results are not in agreement with those of Vanden Auweele *et al.*
18 (1997). Perhaps an explanation for these discrepant findings is that the ex-exercisers in the
19 present study have had negative experiences with exercise in the past or had not achieved
20 their exercise goals, and therefore, might have become more amotivated to engage in exercise.
21 Their relapse into a physically inactive lifestyle could also partly explain why male ex-
22 exercisers had lower levels of barrier efficacy than those who had not exercised in the past
23 (and who had therefore not experienced exercise relapse and drop-out). Ex-exercisers
24 evidently had been unable to resume regular physical activity, and thus may not have been
25 confident that they could overcome various barriers. In females, no significant differences in

exercise history were found between the cluster groups, suggesting that the extent to which one has been physically active in the past is not salient to Greek older sedentary women's motivation, thoughts or feelings about physical activity. In future researchers should use qualitative techniques to examine other factors that might impact upon older women's cognition, motivation and feelings about physical activity within this culture.

Limitations

Some limitations should be borne in mind when interpreting the findings of this study. First, we used the stages of change measure to identify physically inactive participants. Although this measure has been adopted extensively in previous research (Marshall & Biddle, 2001), it is essentially a self-report measure. Thus, it would be interesting to attempt to replicate our results with more objective measures of exercise behaviour. Further, due to our cross-sectional design, the stability of cluster membership over time could not be examined. In addition, the scale used by Vanden Auweele *et al.* (1997) to measure reasons for inactivity and conditions for change was substantially longer and was developed with middle-aged adults. Thus our study might not have been able to capture all relevant motives and facilitating conditions for our targeted population.

Conclusions

In conclusion, the findings of the present study were largely in agreement with our hypotheses. With regard to the first hypothesis, we identified in both gender groups distinct typologies representing those older adults who were unconvinced about taking up exercise and those who were more amenable to change. Further, in the female group there was a unique cluster representing those who were unconcerned about their current levels of physical activity. The identified clusters differed significantly on most psychological validation variables, thus providing partial support to the second hypothesis. Exercise history only appeared to be pertinent in discriminating between the typologies in older males. Overall, the

1 results of the present study suggest that there is a heterogeneity regarding reasons for
2 inactivity and conditions that might facilitate change in sedentary Greek older adults.
3 Implementers of physical activity interventions should target those groups more amenable to
4 change by making physical activity programmes more accessible and more relevant for Greek
5 older females, and by educating older Greek men about the risks of a sedentary lifestyle and
6 the role of physical activity in the prevention of ill health. For those Greek older adults who
7 are unconvinced about increasing their levels of physical activity, interventions that focus on
8 changing beliefs about physical activity, for example, by illustrating the modest amount of
9 exercise that is required to improve health, might be more appropriate.

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Table 1.

Validation of the K-Means Cluster Solution (Males)

Validation variables (score ranges)	Cluster 1:			Cluster 2:					
	Approachable (<i>n</i> = 40)			Unconvinced (<i>n</i> =42)					
	<i>z</i>	<i>Mean</i>	<i>s</i>	<i>Z</i>	<i>Mean</i>	<i>s</i>	<i>F</i>	<i>P</i>	Partial η^2
Attitudes to exercise (-3 - +3)	0.32	1.41 _a	0.17	-0.16	0.87 _b	0.17	4.79	0.03	0.06
Perceived behavioral control (-3 - +3)	0.43	0.52 _a	0.18	-0.01	0.02 _a	0.18	3.80	0.06	0.05
Amotivation (0-4)	-0.42	0.81 _a	0.14	0.10	1.46 _b	0.14	11.0	0.001	0.12
							9		
Barrier efficacy (-3 - +3)	0.33	-0.19 _a	0.17	-0.15	-0.70 _b	0.16	4.76	0.03	0.06
Resistance to change (1-7)	-0.13	4.21 _a	0.14	-0.04	4.45 _a	0.14	1.56	0.22	0.02
Physical self-worth (1-4)	0.25	2.77 _a	0.10	0.05	2.54 _a	0.10	2.43	0.12	0.03

Note. Subscripts with the same letter in the same row do not differ at $P < 0.05$

Table 2.

Validation of the K-Means Cluster Solution (Females)

Validation variables	Cluster 1:			Cluster 2:			Cluster 3:					
(score ranges)	Unconcerned ($n = 14$)			Approachable ($n = 38$)			Unconvinced ($n = 34$)					
	z	$Mean$	s	z	$Mean$	s	z	$Mean$	s	F	P	Partial η^2
Attitudes to exercise (-3 - +3)	0.98	2.29 _a	0.32	-0.04	0.99 _b	0.19	-0.64	0.23 _c	0.20	14.99	0.000	0.27
Perceived behavioral control (-3 - +3)	0.04	0.05 _a	0.33	-0.24	-0.24 _a	0.20	-0.21	-0.27 _a	0.21	0.34	0.71	0.01
Amotivation (0-4)	-0.88	0.52 _a	0.24	0.17	1.42 _b	0.14	0.47	1.77 _b	0.15	10.04	0.000	0.20
Barrier efficacy (-3 - +3)	0.36	-0.17 _a	0.29	0.14	-0.36 _a	0.18	-0.59	-1.16 _b	0.19	6.51	0.002	0.14
Resistance to change (1-7)	0.25	4.53 _a	0.21	-0.10	4.32 _a	0.12	0.22	4.57 _a	0.13	1.01	0.37	0.02
Physical self-worth (1-4)	0.36	2.80 _a	0.17	-0.26	2.41 _a	0.09	-0.19	2.45 _a	0.11	2.20	0.12	0.05

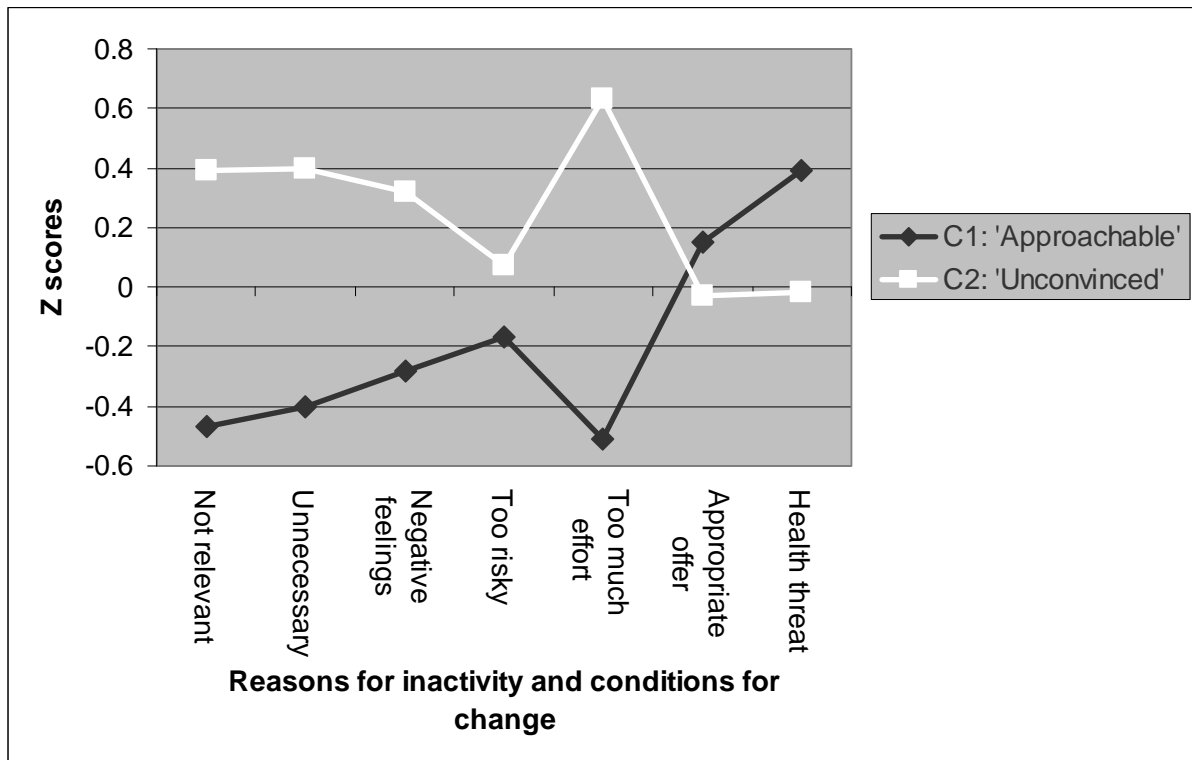
Note. Subscripts with the same letter in the same row do not differ at $P < 0.05$

Figure Captions

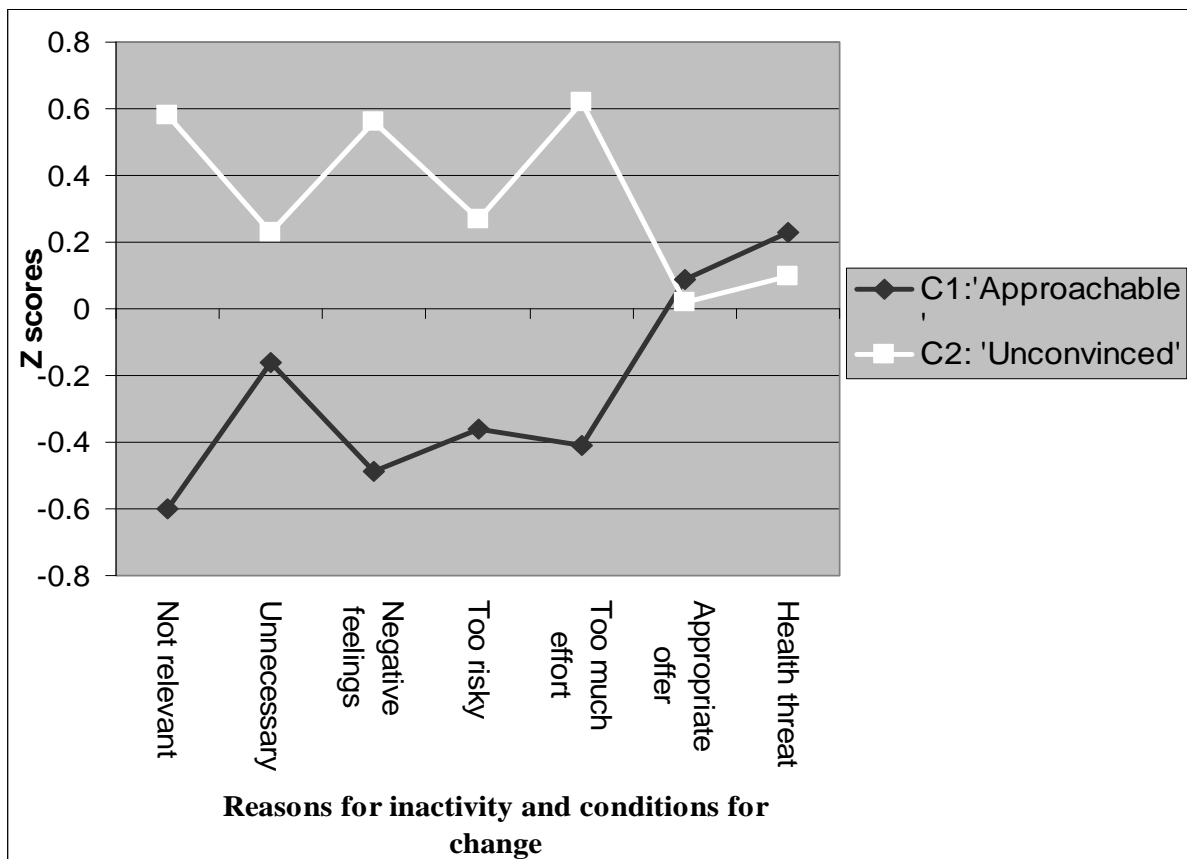
Figure 1. Cluster analysis on reasons for not exercising and conditions for change in males

Figure 2. Cluster analysis on reasons for not exercising and conditions for change in females

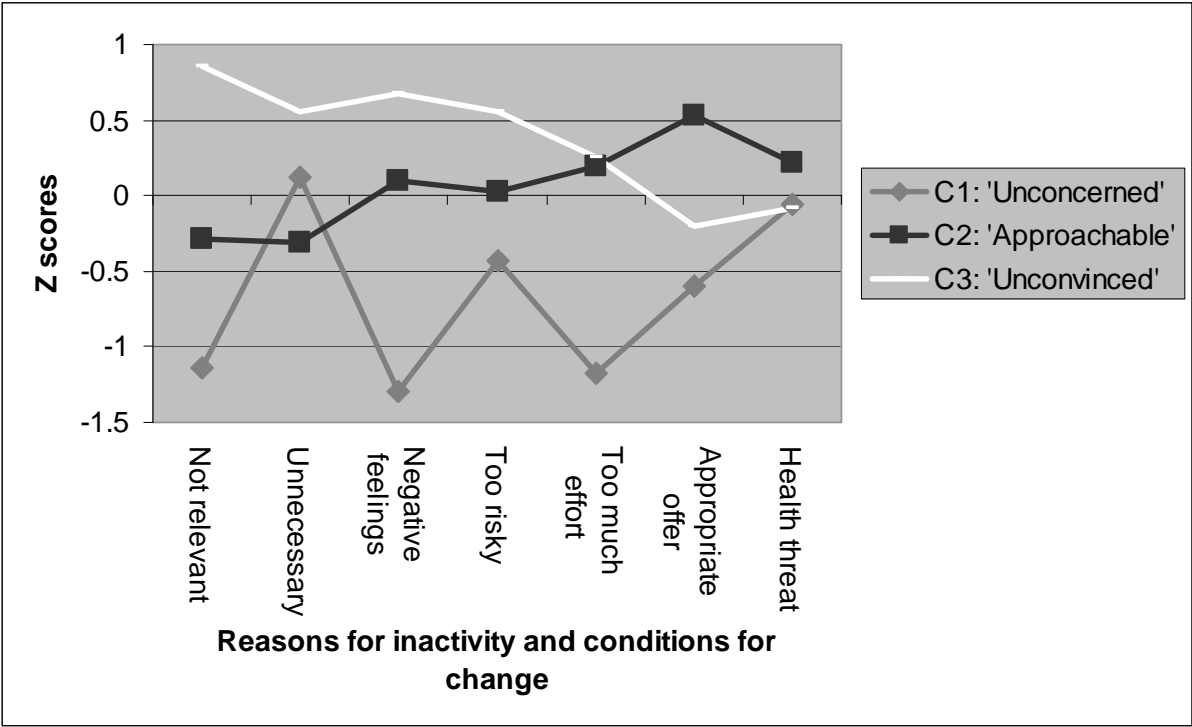
Hierarchical analysis



K-means analysis



Hierarchical analysis



K-means analysis

